

Available online at [www.sciencedirect.com](http://www.sciencedirect.com)

ScienceDirect

journal homepage: [www.e-asianjournalsurgery.com](http://www.e-asianjournalsurgery.com)

## ORIGINAL ARTICLE

# Experience and learning curve of retroperitoneal laparoscopic ureterolithotomy



Hakan Ercil, Adem Altunkol\*, Faruk Kuyucu, Nevzat Can Sener, Ediz Vuruskan, Ferhat Ortoglu, Zafer Gokhan Gurbuz

Ministry of Health, Department of Urology, Adana Numune Training and Research Hospital, Adana, Turkey

Received 24 March 2014; received in revised form 22 April 2014; accepted 12 May 2014  
Available online 22 July 2014

**KEYWORDS**

calculi;  
laparoscopy;  
ureter

**Summary** *Objective:* This study was conducted to evaluate clinical experience and learning curve associated with laparoscopic ureterolithotomy performed for upper ureteral stones.

*Materials and methods:* The medical data of 50 patients who had undergone retroperitoneal laparoscopic ureterolithotomy between June 2010 and March 2013 were retrospectively analyzed. To assess the learning curve, patients were divided into two groups: Group A (the first 25 cases) and Group B (the last 25 cases). In Group A, double J stents were placed in 17 patients, whereas in Group B 15 patients received double J stents. In Group A, three ports were placed in nine patients and four ports in 16 patients. In Group B, three ports were placed in 20 patients and five patients had four ports. The patients were compared according to demographics, operative time, stone size, complications, hospital stay, and transfusion.

*Results:* The mean age for Group A was  $47.8 \pm 14.13$  (21–72) years and that for Group B was  $44.2 \pm 14.98$  (22–78) years. Mean operative times were  $106.4 \pm 38$  (55–210) minutes and  $70.76 \pm 30.4$  (30–180) minutes for Groups A and B, respectively ( $p < 0.05$ ). The mean hospital stay was  $7.12 \pm 4.47$  (3–22) days and  $4.04 \pm 2.05$  (2–12) days for Groups A and B, respectively ( $p < 0.05$ ). The mean stone size was  $20.12 \pm 5.18$  (12–30) mm and  $19.44 \pm 4.44$  (13–28) mm for Groups A and B, respectively ( $p > 0.05$ ).

Conflicts of interest: The authors declare that they have no financial or nonfinancial conflicts of interest related to the subject matter or materials discussed in this article.

\* Corresponding author. Ministry of Health, Department of Urology, Adana Numune Training and Research Hospital, Baskent Hastanesi Karsisi, 01330 Yuregir, Adana, Turkey.

E-mail address: [ademaltunkol@hotmail.com](mailto:ademaltunkol@hotmail.com) (A. Altunkol).

<http://dx.doi.org/10.1016/j.asjsur.2014.05.002>

1015-9584/Copyright © 2014, Asian Surgical Association. Published by Elsevier Taiwan LLC. All rights reserved.

**Conclusion:** In our study, as staff experience (in performing laparoscopic retroperitoneal ureterolithotomy) increased, operative time, length of hospital stay, and complication rates have correspondingly declined.

Copyright © 2014, Asian Surgical Association. Published by Elsevier Taiwan LLC. All rights reserved.

## 1. Introduction

The application of laparoscopic surgery in the treatment of urinary system stone diseases, which are as old as mankind, began in the second half of the past century. The first retroperitoneoscopic investigation was completed by Bartel<sup>1</sup> in 1969 through the observation of the retroperitoneoscopic area after the insertion of a short endoscope through the flank incision and the base of the retroperitoneoscopy was laid. Wickham<sup>2</sup> in 1979 was the first to perform retroperitoneal laparoscopic ureterolithotomy. Laparoscopic ureterolithotomy is indicated in failed extracorporeal shock wave lithotripsy (ESWL) or in patients with large and impacted ureter stones who had previously received ureteroscopic treatment.<sup>3</sup> Laparoscopic ureterolithotomy has been preferred more in recent years because it is less invasive, is more cosmetically successful, and requires a shorter duration of hospitalization compared to open ureterolithotomy.<sup>4</sup>

A total of 50 patients with impacted upper urinary tract calculi underwent elective retroperitoneal laparoscopic ureterolithotomy between June 2010 and March 2013. The aim of the present study was to evaluate the learning curve and experiences by comparing the first 25 consecutive patients with another group of 25 consecutive patients, and to provide an insight for urologists who have recently begun performing laparoscopic surgery.

## 2. Materials and methods

The medical records of 50 patients, who underwent retroperitoneal laparoscopic ureterolithotomy between June 2010 and March 2013 because of a large impacted proximal ureteral stone (12–30 mm), were retrospectively reviewed. The data of the first 25 consecutive patients (Group A) were compared with the data of the next 25 consecutive patients (Group B). All patients were operated on by the same surgeon.

The ureter can be divided into upper, middle, and lower segments. The upper ureter extends from the renal pelvis to the upper border of the sacrum. The patients with distal or midureteral stones, patients who underwent transperitoneal laparoscopic ureterolithotomy, patients presenting with a second stone in the same ureter, and pediatric patients were excluded from the study. Laparoscopic ureterolithotomy is indicated in failed extracorporeal shock wave lithotripsy (ESWL) or in patients with large and impacted ureter stones who had previously received ureteroscopic treatment.<sup>3</sup> In Group A, five patients had a history of unsuccessful ESWL, two patients had an

unsuccessful URS, and 18 patients had impacted stones. In Group B, there were five patients with unsuccessful ESWL, three had unsuccessful URS, and 17 had impacted stones.

Routine surgical tests were conducted on the patients, and all patients were evaluated with direct urinary system radiography (DUSG), ultrasonography, and/or computerized tomography (CT) prior to the operation. The size of the ureter stones were evaluated as the largest diameter of the stone in DUSG. The patients who had nonopaque stones were evaluated according to the size of the stone that was measured in CT.

In Group A, the stone was located in the right ureter in 11 patients and in the left ureter in 14 patients. In Group B, the stone was located in the right ureter in 13 patients and in the left ureter in 12 patients (Table 1). In Group A, four ports were placed in 16 patients, and three ports were placed in nine patients. In Group B, four ports were placed in five patients, and three ports were placed in 20 patients. The double J (DJ) stent is not routinely inserted in patients undergoing a laparoscopic ureterolithotomy procedure at our clinic. The decision to insert a DJ stent is made in the postoperative period for patients with stones large enough to slightly traumatize the ureter and for patients having problems in suture placement that would lead to urinary leakage. The DJ stent is inserted through ureterocystoscopy under local anesthesia in patients with prolonged urine drainage in the postoperative period. On postoperative Day 1, patients with opaque stones were evaluated with direct urinary system graph (DUSG), and patients with nonopaque stones were evaluated with low-dose noncontrast CT. The urethral catheters were removed 48 hours later in patients who had no drainage in the postoperative period. If no drainage was present after the removal of the catheter, the drainage tube was removed, and the patient was discharged. The DJ stents that were inserted were removed 21 days after the date of discharge, under local anesthesia with cystoscopy.

### 2.1. Operation technique

After the insertion of a nasogastric tube and urethral catheter under general anesthesia, the patients were placed in the semiflank position prior to the procedure. The retroperitoneal laparoscopic procedure was conducted on all patients. The surgery was performed via three ports. After entering the retroperitoneum with a blunt dissection and an incision of 15 mm, 1–2 cm below the tip of the 12<sup>th</sup> rib, a retroperitoneal area was formed with a balloon dissector of 1000 cm<sup>3</sup> (Pajunk Medizintechnologie, Geisingen, Germany). After the removal of the balloon, a Hasson trocar was inserted from the same incision. Under a

**Table 1** Demographic characteristics and statistical comparison of the two groups.

|                                       | Group A (n = 25)                       | Group B (n = 25)                       | p        |
|---------------------------------------|--|--|----------|
| Mean age (y)                          | 47.80 ± 14.13                          | 44.20 ± 14.98                          | 0.39     |
| Sex (male/female)                     | 15/10                                  | 18/7                                   | NA       |
| Mean follow-up period (mo)            | 35.56 ± 9.11                           | 15.32 ± 3.00                           | NA       |
| Stone side (right ureter/left ureter) | 11/14                                  | 13/12                                  | NA       |
| Mean BMI (kg/m <sup>2</sup> )         | 26.70 ± 1.42                           | 26.68 ± 1.56                           | 0.96     |
| Mean stone size (mm)                  | 20.12 ± 5.18                           | 19.44 ± 4.44                           | 0.62     |
| Mean hospital stay (d)                | 7.12 ± 4.47                            | 4.04 ± 2.05                            | 0.003*   |
| Mean operation time (min)             | 106.40 ± 38                            | 70.76 ± 30.40                          | 0.001*   |
| Number of ports                       | 16 patients 4 ports/9 patients 3 ports | 5 patients 4 ports/20 patients 3 ports | 0.001*   |
| Mean blood loss (mL)                  | 85.08 ± 14.45                          | 42.72 ± 9.63                           | < 0.001* |

\* $p < 0.05$  is statistically significant.

BMI = body mass index; NA = not applicable.

pressure of 15–18 mmHg, two trocars of 5 mm were inserted under optical view. When required, a fourth trocar of 5 mm was inserted for dispensing. After trocar insertion, the intra-abdominal pressure was maintained at 12–15 mmHg for perioperative pneumoperitoneum.

The ureter was found by taking the psoas as base and dissecting the Gerota's fascia to the medial. The stone was accessed by following the ureter. After dissection of the ureter by passing to the upper part of the stone, a proximal Babcock was placed and the ureter was cut above the stone by pure cut electrocauterization with needle point laparoscopic electrode. The stone that was removed from the ureter was placed inside an organ and tissue retrieval bag and laid on the psoas for extraction. DJ stents were placed into the ureter by inserting into the laparoscopic port. The incision was closed using 4–0 polyglactin interrupted sutures. Two or three sutures were placed along the incision line that was found on the ureter of all patients. In all cases, a drainage tube was inserted in the lodge. The subcutaneous incision was closed with absorbable sutures, and the skin incision was closed with nonabsorbable sutures.

## 2.2. Statistical analysis

Statistical analyses were performed using SPSS version 20.0 software (SPSS Inc., Chicago, IL, USA). The Student *t* test was used for parametric variables, the Mann–Whitney *U* test was used for nonparametric variables, and  $p < 0.05$  was accepted as statistically significant.

## 3. Results

The demographic data of the patients in the two groups, data related to the surgery, and statistical comparisons are presented in Table 1. The procedure resulted in retroperitoneal stone expulsion in four patients in Group A, and the efforts spent to locate the stone prolonged the operation time. The Babcock forceps was placed in the proximal ureter in both groups; however, the stone migrated into the kidney in one patient. A flexible cystoscope (Karl-Storz 11272C115.5 FR, Karl Storz, Tuttlingen, Germany) was advanced through the laparoscopic port into the ureter via ureterolithotomy, in line with the kidney, and the stone was

removed by grasping with the basket. Open surgery was not necessary in the two groups, and none of the patients required blood transfusion. The procedure was regarded as unsuccessful if the patient required additional intervention. Accordingly, the success rate was 80% in Group A and 96% in Group B, and the success rate was found to be statistically similar in the two groups ( $p > 0.05$ ). Ureteral avulsion, retroperitoneal hematoma, bowel injury, vascular injury, or mortality did not occur in the two groups. None of the patients developed herniation during the follow-up period. Prolonged urine drainage was observed in three patients in Group A owing to postoperative urine leakage from the anastomosis site. One of these patients had a DJ stent in place, and the renewal of the stent on postoperative Day 7 stopped urinary drainage. The lumen of the removed DJ stent was seen to be obstructed with encrusted material. In the other two patients, urine drainage stopped after the placement of a DJ stent. In Group B, one patient had prolonged urine drainage owing to urine leakage in the early postoperative period. Urine drainage in this patient stopped after placement of a DJ stent on postoperative Day 9. A DJ stent was placed in 17 patients in Group A and in 15 patients in Group B. Three patients in Group A in a follow-up period of  $35.56 \pm 9.11$  months and one patient in Group B in a follow-up period of  $15.32 \pm 3$  months developed ureteral stenosis. Eleven patients (44%) in Group A and three patients (12%) in Group B developed complications, and there was a significant difference between the groups in terms of the rate of complications ( $p < 0.05$ ; Table 2).

**Table 2** Comparison of complications in the two groups.

| Complications                   | Group A (n = 25) | Group B (n = 25) | p      |
|---------------------------------|------------------|------------------|--------|
| Stone migration                 | 1 (4)            | 1 (4)            |        |
| Prolonged urinary drainage      | 3 (12)           | 1 (4)            |        |
| Ureteral stricture              | 3 (12)           | 1 (4)            |        |
| Retroperitoneal stone expulsion | 4 (16)           | 0                |        |
| Total                           | 11 (44)          | 3 (12)           | 0.013* |

Data are presented as n (%).

\* $p < 0.05$  is statistically significant.

## 4. Discussion

Laparoscopic surgery is performed in situations where ESWL and endourological techniques are inadequate or unsuccessful, and in the presence of other accompanying pathologies and abnormalities in addition to the stone disease.<sup>5,6</sup> In recent years, by the development of flexible ureteroscope and fine needle laser lithotripters, the application ratio of open or laparoscopic surgical methods in the treatment of large and impacted stones has decreased.<sup>2</sup> The European Association of Urology 2013 guideline emphasizes that laparoscopic surgery should be prioritized in centers in which there is adequate experience in laparoscopy.<sup>5</sup> Laparoscopic ureterolithotomy can be performed via the transperitoneal or the retroperitoneal approach.<sup>7,8</sup> The advantages of a transperitoneal approach are as follows: it provides a larger surgical field; the organs such as the spleen, liver, and colon can be accessed; and it provides better maneuverability as the distance between the port locations is sufficient. In the retroperitoneal approach, although there is difficulty to work in a limited and narrow area, the duration of hospitalization and complication rates are generally low and retroperitoneal interventions could be easily performed in abdominal surgeries.<sup>9</sup> Furthermore, the low risk of urine leakage into the peritoneal cavity, low risk of peritonitis, low rates of peritoneal irritation caused by CO<sub>2</sub>, and lower nonsteroidal anti-inflammatory drug requirements are among the advantages of retroperitoneal laparoscopic ureterolithotomy.<sup>10,11</sup> The studies have reported a shorter length of hospital stay in patients operated on with the retroperitoneal approach, but surgical success rates were similar between the two approaches.<sup>12</sup> Although the first ureterolithotomy cases in our clinic were conducted by the transperitoneal approach, in the following course, we preferred the retroperitoneal approach because of its advantages. The most significant difficulty in the retroperitoneal approach was the intensity of the fat tissue within the Gerota's fascia. There was difficulty finding the ureter within the fat tissue. Some authors report that the ureteral stent, which is inserted prior to the procedure, may be helpful in finding the ureter.<sup>13</sup> In the current study, a ureteral stent was not inserted in the patients prior to the procedure. By increasing the number of cases and our experience, it became easier to find the ureter and the duration of surgery was shortened significantly in the last 25 cases when compared to the first 25 cases.

Generally, from three to six ports are required for laparoscopic surgery. With the increase in the number of ports, the risk of bleeding, organ damage, herniation, and cosmetic concerns also increase.<sup>14,15</sup> During follow-up, herniation was not observed in any patient. When laparoscopic surgery is compared to open surgery, they were found to be similar in terms of duration of surgery and bleeding, whereas laparoscopic surgery was found to be superior in terms of number of analgesic days, duration of hospitalization, duration of healing, and cosmetic results.<sup>16</sup> In our patients, the use of nonsteroidal anti-inflammatory drugs alone was sufficient for pain management, and no narcotic analgesic was required in any patient. There appears to be a significant learning curve for the laparoscopic

procedure, and the training for this technique requires careful observation and intense efforts.<sup>17</sup>

Fan et al<sup>18</sup> performed laparoscopic ureterolithotomy and compared the data of the first 20 consecutive patients with the data of the next 20 consecutive patients, and the authors evaluated their learning curves and experiences. They concluded that laparoscopic ureterolithotomy was an effective and safe procedure, offering a short learning curve and shortening of the operation time with increased experience.<sup>18</sup>

In the studies by Chong et al,<sup>19</sup> Avital et al,<sup>20</sup> and Hatipoğlu et al,<sup>21</sup> consecutive patients were divided into two groups according to chronological order, and operation time, length of hospital stay, and complications were compared between the groups in terms of first and last cases. They reported significant decreases in the operation time, length of hospital stay, and perioperative complications in the latter groups, and improvement in the surgical outcomes with increasing experience. In the present study, a case series of 50 patients was divided into two groups to compare the first 25 consecutive patients with the next 25 consecutive patients, and the authors evaluated their own learning curve and experiences. Operation time, length of hospital stay, and the rate of complications were significantly lower in the 25 consecutive patients in the latter group. These results are consistent with those reported in the literature.

In a series of laparoscopic ureterolithotomy including 74 patients, El-Moula et al<sup>22</sup> performed retroperitoneal intervention in 66 patients and reported a surgical success rate of 94.6%. At the end of the study, they reported that laparoscopic ureterolithotomy is an effective and safe surgical procedure in large stones that did not benefit from ESWL.<sup>22</sup> Although all stones were removed in the current series of patients, additional intervention was required because of retroperitoneal stone expulsion in four patients and migration of the stone into the kidney in one patient in Group A. Likewise, one patient in Group B required additional intervention owing to migration of the stone into the kidney. Open surgery was not performed in patients requiring additional intervention. Accordingly, the success rate was 80% in Group A and 96% in Group B.

The rate of lack of stones in laparoscopic ureterolithotomies is generally 100%, and the rate of open surgery is low. Open surgery is indicated in the case of migration of the stone to the kidney, intra-abdominal organ damage, and the loss of pneumoperitoneum. The most common postoperative complication is ureteral urine leakage. The ureteral stricture can be seen at a rate of 20% as a late complication.<sup>23–25</sup>

In our series, open surgery was not indicated in any of the cases; a total of four ureteral strictures—three (12%) in Group A and one (4%) in Group B—developed in the late postoperative period. Urethral stricture can be seen in 20% of patients as a late complication.<sup>23–25</sup> In our groups, we encountered urethral stricture at a mean of 5 months in Group A and 3 months in Group B. The rate of ureteral stenosis was similar to that reported in the literature in the first 25 consecutive patients; however, this rate was lower than that reported in the literature in the latter 25 consecutive patients. The present study suggests that the



rate of complications decreased with increasing experience and learning curve. The low rate of ureteral stenosis in the current cases was attributed to the placement of a DJ stent, which contributed to the rapid recovery of the ureter in the postoperative period and decreased the likelihood of developing stenosis during this period. In a series of 101 patients, Gaur<sup>8</sup> reported the mean duration of hospitalization as 3.5 days and mean duration of surgery as 79 minutes. In the series of Gaur,<sup>8</sup> ureteral avulsion developed in one patient, prolonged urine leakage after the operation was seen in 20 patients, and open surgery was indicated in eight patients. According to the results of the study, it was shown that laparoscopic ureterolithotomy can be safely used in large ureter stones impacted in the mucosa, for which ESWL and endourological techniques were ineffective or in patients with a solitary kidney.<sup>8</sup>

## 5. Conclusion

Proximal ureteral stones that cannot be otherwise treated with ESWL or endoscopic methods can be treated with retroperitoneal laparoscopic ureterolithotomy owing to the low complication rates, shorter length of hospital stay, and high success rate. According to the current results, operation time, length of hospital stay, and the rate of complications decrease with increasing experience with retroperitoneal laparoscopic ureterolithotomy.

## References

1. Bartel M. Die retroperitoneoskopie. Eine endoskopische methode zur inspektion und bioptischen untersuchung des retroperitonealen raumes [Retroperitoneoscopy. An endoscopic method for inspection and bioptic examination of the retroperitoneal space]. *Zentralbl Chir.* 1969;94:377–383 [Article in German].
2. Wickham JE. The surgical treatment of urinary lithiasis. In: Wickham JE, ed. *Urinary Calculus Disease*. Edinburgh: Churchill Livingstone; 1979:145.
3. Wein AJ, Kavoussi LR, Novick AC, Partin AW, Peters CA. *Campbell–Walsh Urology*. 10th ed. Philadelphia: Elsevier Saunders; 2012.
4. Wen X, Liu X, Huang H, et al. Retroperitoneal laparoendoscopic single-site ureterolithotomy: a comparison with conventional laparoscopic surgery. *J Endourol.* 2012;26:366–371.
5. Turk C, Knoll T, Petrik A, et al. *Guidelines on Urolithiasis*. European Association of Urology; 2013. [www.uroweb.org](http://www.uroweb.org).
6. Simforoosh N, Basiri A, Danesh AK, et al. Laparoscopic management of ureteral calculi: a report of 123 cases. *Urol J.* 2007;4:138–141.
7. Wuernschimmel E, Lipsky H. Laparoscopic treatment of an upper ureteral stone. *J Laparoendosc Surg.* 1993;3:301–307.
8. Gaur DD. Laparoscopic operative retroperitoneoscopy: use of new device. *J Urol.* 1992;148:1137–1139.
9. Demir Ö, Öztürk B, Egriboyun S, Esen A. Kliniğimizde laparoskopik cerrahide ilk deneyimlerimiz ve öğrenme süreci. *Dokuz Eylül Tıp Fakültesi Dergisi.* 2010;24:105–112 [in Turkish].
10. Bove P, Micali S, Miano R, et al. Laparoscopic ureterolithotomy: a comparison between the transperitoneal and the retroperitoneal approach during the learning curve. *J Endourol.* 2009;23:953–957.
11. Hammady A, Gamal WM, Zaki M, Hussein M, Abuzeid A. Evaluation of ureteral stent placement after retroperitoneal laparoscopic ureterolithotomy for upper ureteral stone: randomized controlled study. *J Endourol.* 2011;25:825–830.
12. Singh V, Sinha RJ, Gupta DK, Kumar M, Akhtar A. Transperitoneal versus retroperitoneal laparoscopic ureterolithotomy: a prospective randomized comparison study. *J Urol.* 2013;189:940–945.
13. Ertuğrul A, Yıldırım A, Türkeri L, İlker Y, Şimşek F, Aktaş A. Üreter alt uç taşlarının endoskopik tedavisinde deneyimlerimiz. *1'nci İstanbul ürolitiasis sempozyumu*, Program ve özetler, 122, 28–29 Mayıs, 1999. [in Turkish].
14. Lowry PS, Moon TD, D'Alessandro A, Nakada SY. Symptomatic port-site hernia associated with a non-bladed trocar after laparoscopic live-donor nephrectomy. *J Endourol.* 2003;17:493–494.
15. Marcovici I. Significant abdominal wall hematoma from an umbilical port insertion. *JSLs.* 2001;5:293–295.
16. Goel A, Hemal AK. Upper and mid-ureteric stones: a prospective unrandomized comparison of retroperitoneoscopic and open ureterolithotomy. *BJU Int.* 2001;88:679–682.
17. Phillips J, Catto JWF, Lavin V, et al. The laparoscopic nephrectomy learning curve: a single centre's development of a de novo practice. *Postgrad Med J.* 2005;81:599–603.
18. Fan T, Xian P, Yang L, Liu Y, Wei Q, Li H. Experience and learning curve of retroperitoneal laparoscopic ureterolithotomy for upper ureteral calculi. *J Endourol.* 2009;23:1867–1870.
19. Chong GO, Park NY, Hong DG, Cho YL, Park IS, Lee YS. Learning curve of laparoscopic radical hysterectomy with pelvic and/or para-aortic lymphadenectomy in the early and locally advanced cervical cancer: comparison of the first 50 and second 50 cases. *Int J Gynecol Cancer.* 2009;19:1459–1464.
20. Avital S, Hermon H, Greenberg R, Karin E, Skornick Y. Learning curve in laparoscopic colorectal surgery: our first 100 patients. *Isr Med Assoc J.* 2006;8:683–686.
21. Hatipoğlu NK, Penbegül N, Söylemez H, et al. Urological laparoscopic surgery: our experience of first 100 cases in Dicle University. *J Clin Exp Invest.* 2012;3:44–48.
22. El-Moula MG, Abdallah A, El-Anany F, et al. Laparoscopic ureterolithotomy: our experience with 74 cases. *Int J Urol.* 2008;15:593–597.
23. Flasko T, Holman E, Kovacs G, Tallai B, Toth C, Salah MA. Laparoscopic ureterolithotomy: the method of choice in selected cases. *J Laparoendosc Adv Surg Technol A.* 2005;15:149–152.
24. Harewood LM, Webb DR, Pope AJ. Laparoscopic ureterolithotomy: the results of an initial series, and an evaluation of its role in the management of ureteric calculi. *Br J Urol.* 1994;74:170–176.
25. Demirci D, Gülmez I, Ekmekçioğlu O, Karacagil M. Retroperitoneoscopic ureterolithotomy for the treatment of ureteral calculi. *Urol Int.* 2004;73:234–247.